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INTELLECTUAL PROPERTY LAW

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Re: Correction of Mistake in Printed Patent Under §1480 of the Manual of Patent Examining Procedures

U.S. Patent No.:	6,914,939
Date of Patent:	July 5, 2005
Inventor(s):	Boice et al.
IBM Docket No.:	END920000090US1
Our File No.:	0827.075

Dear Sir:

Upon proofreading the sealed patent, we noticed an error made by the Patent Office.

Transmitted herewith is a proposed Certificate of Correction effecting a corrective amendment.

The patentee respectfully solicits the granting of the requested Certificate of Correction.

Respectfully submitted,

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KPR/cma
Enclosure

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July 20, 2005

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. 6,914,939

DATED July 5, 2005

INVENTOR(S) Boice et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Specification:

Col. 9, lines 1-15, insert the following Formula (4) structure in place of the structure on the sealed patent:

$$
\begin{aligned}
z_{F,d45} = (g_1 + g_2 + g_3)^{-1}\Big(& (m_r - 1)^{-1}(m_c - 1)^{-1} \sum_{i=1}^{m_r-1} \sum_{j=0}^{m_c-2} g_1 \left| y_t(i,j) - y_t(i-1,j+1) \right| \\
& + (n_r - 1)^{-1}(n_c - 1)^{-1} \sum_{i=1}^{n_r-1} \sum_{j=0}^{n_c-2} g_2 \left| cb_t(i,j) - cb_t(i-1,j+1) \right| \\
& + (n_r - 1)^{-1}(n_c - 1)^{-1} \sum_{i=1}^{n_r-1} \sum_{j=0}^{n_c-2} g_3 \left| cr_t(i,j) - cr_t(i-1,j+1) \right| \Big)
\end{aligned} \tag{4}
$$

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PATENT NO.:

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$$Z_{F,d45}=(g_1+g_2+g_3)^{-1}\Big((m_r-1)^{-1}(m_c-1)^{-1}\sum_{i=1}^{m_r-1}\sum_{j=0}^{m_c-2}g_1|y_t(i,j)-y_t(i-1,j+1)|+(n_r-1)^{-1}(n_c-1)^{-1}\sum_{i=1}^{n_r-1}\sum_{j=0}^{n_c-2}g_2|cb_t(i,j)-cb_t(i-j\;j+1)|+(n_r-1)^{-1}(n_c-1)^{-1}\sum_{i=1}^{n_r-1}\sum_{j=0}^{n_c-2}g_3|cr_t(i,j)-cr_t(i-1,j+1)|\Big) \tag{4}$$

This should be a "1", not a "j".

$$Z_{F,d135}=(g_1+g_2+g_3)^{-1}\Big((m_r-1)^{-1}(m_c-1)^{-1}\Big(\sum_{i=0}^{m_r-2}\sum_{j=0}^{m_c-2}g_1|y_t(i,j)-y_t(i+1,j+1)|+(n_r-1)^{-1}(n_c-1)^{-1}\sum_{i=0}^{n_r-2}\sum_{j=0}^{n_c-2}g_2|cb_t(i,j)-cb_t(i+1,j+1)|+(n_r-1)^{-1}(n_c-1)^{-1}\sum_{i=0}^{n_r-2}\sum_{j=0}^{n_c-2}g_3|cr_t(i,j)-cr_t(i+1,j+1)|\Big) \tag{5}$$

Field-based statistical measures for interlaced pictures, where frame encoding mode is considered, are calculated as:

$$Z_{f,v}=\frac{f_1Z_{f,v}^{top}+f_2Z_{f,v}^{bot}}{f_1+f_2} \tag{6}$$

$$Z_{f,d45}=\frac{f_1Z_{f,d45}^{top}+f_2Z_{f,d45}^{bot}}{f_1+f_2} \tag{7}$$

$$Z_{f,d135}=\frac{f_1Z_{f,d135}^{top}+f_2Z_{f,d135}^{bot}}{f_1+f_2} \tag{8}$$

with $f_1=1.0$ and $f_2=1.0$, and top and bot representing top and bottom fields of an interlaced frame, respectively. Each line of the top field of an interlaced frame is spatially located above a line of the bottom field of the same frame. Components of equations (6), (7) and (8) can be computed as:

$$Z_{f,v}^{x}=(g_1+g_2+g_3)^{-1}\Big((m/2-m_c)^{-1}\sum_{j=0}^{m_c-1}\sum_{i=0}^{m_r/2-2}g_1|y_t(2i+o_x,j)-y_t(2(i+1)+o_x,j)|+(n/2-n_c)^{-1}\sum_{j=0}^{n_c-1}\sum_{i=0}^{n_r/2-2}g_2|cb_t(2i+o_x,j)-cb_t(2(i+1)+o_x,j)|+(n/2-n_c)^{-1}\sum_{j=0}^{n_c-1}\sum_{i=0}^{n_r/2-2}g_3|cr_t(2i+o_x,j)-cr_t(2(i+1)+o_x,j)|\Big) \tag{9}$$

-continued

$$Z_{f,d45}^{x}=(g_1+g_2+g_3)^{-1}\times\Big((m_r/2-1)^{-1}(m_c-1)^{-1}\sum_{i=1}^{m_r/2-1}\sum_{j=0}^{m_c-2}g_1|y_t(2i+o_x,j)-y_t(2(i-1)+o_x,j+1)|+(n_r/2-1)^{-1}(n_c-1)^{-1}\sum_{i=1}^{n_r/2-1}\sum_{j=0}^{n_c-2}g_2|cb_t(2i+o_x,j)-cb_t(2(i-1)+o_x,j+1)|+(n_r/2-1)^{-1}(n_c-1)^{-1}\sum_{i=1}^{n_r/2-1}\sum_{j=0}^{n_c-2}g_3|cr_t(2i+o_x,j)-cr_t(2(i-1)+o_x,j+1)|\Big) \tag{10}$$

$$Z_{f,d135}^{x}=(g_1+g_2+g_3)^{-1}\times\Big((m_r/2-1)^{-1}(m_c-1)^{-1}\sum_{i=0}^{m_r/2-2}\sum_{j=0}^{m_c-2}g_1|y_t(2i+o_x,j)-y_t(2(i+1)+o_x,j+1)|+(n_r/2-1)^{-1}(n_c-1)^{-1}\sum_{i=0}^{n_r/2-2}\sum_{j=0}^{n_c-2}g_2|cb_t(2i+o_x,j)-cb_t(2(i+1)+o_x,j+1)|+n_r/2-1)^{-1}(n_c-1)^{-1}\sum_{i=0}^{n_r/2-2}\sum_{j=0}^{n_c-2}g_3|cr_t(2i+o_x,j)-cr_t(2(i+1)+o_x,j+1)|\Big) \tag{11}$$

where x represents the type of field, i.e., top or bot, and for x=top, $0_x=0_{top}=0$ and for x=bot, $0_x=0_{bot}=1$. For the case where the encoder is set in the field encoding mode, each picture is stored in the memory unit of FIG. **1** as a field. In this case, all inter-pixel statistical measures are computed using equations (2), (3), (4), and (5) with m_r and n_r taking on the field resolutions for luminance and chrominance components, respectively. Finally, an example for values of gs are: $g_1=2.0$, $g_2=1.0$, and $g_3=1.0$.

In accordance with one embodiment of the present invention, a set of picture-based statistical measures (Z_h, $Z_{F,v}$, $Z_{f,v}$, $Z_{F,d45}$, $Z_{f,d45}$, $Z_{F,d135}$ and $Z_{f,d135}$) are fed to the picture difficulty evaluator **124** of FIG. **2**. Depending on the encoder's mode of operation or the nature of the input source, a sub-set of statistical indicators are computed and sent to the difficulty measure comparator. For example, if the user knows the source is progressive, only Z_h, $Z_{F,v}$, $Z_{F,d45}$, and $Z_{F,d135}$ are calculated with the proper frame resolutions, and all switches **125** corresponding to these indicators are turned on in FIG. **2**. If the source is interlaced and the user sets the encoder in field encoding mode, again the indicators Z_h, $Z_{F,v}$, $Z_{F,d45}$, and $Z_{F,d135}$ are calculated, this time with field resolutions. For the aforementioned cases a final statistical measure Z_{max} is obtained by a difficulty measure comparator **126** such that:

$$Z_{max}=\mathrm{MAX}(Z_h,Z_{F,v},Z_{F,d45},Z_{F,d135}) \tag{12}$$

If the user sets the encoder for frame encoding mode of an interlaced source, all seven inputs to picture difficulty evaluator of FIG. **2** are present and computed, i.e., Z_h, $Z_{F,v}$, $Z_{f,v}$, $Z_{F,d45}$, $Z_{f,d45}$, $Z_{F,d135}$, and $Z_{f,d135}$. This means that all switches **125** to picture difficulty evaluator **124** of FIG. **2** are